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AUTHOR Barker, Bruce O.
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ABSTRACT

The Internet is a decentralized collection of computer networks managed by separate groups using a common set of technical standards. The Internet has tremendous potential as an educational resource by providing access to networking through worldwide electronic mail, various databases, and electronic bulletin boards; collaborative investigation across geographic and political boundaries; and a wide range of resources that can be used at times convenient to the user. The Internet's resources can be grouped into three categories: messaging, which includes e-mail and discussion groups; remote login, which permits a user to access another computer's information; and file exchange, the transfer of information accessed from another computer to the user's computer. The Internet can benefit small rural schools by providing access to the same information heretofore available only to affluent schools. Drawbacks include slow access, the "additive" nature of the Internet, and the fact that the Internet is uncensored. Some schools have policies that permit access to controversial information only when permission is granted and the purpose and educational value have been identified. Use of the Internet is not free. Ways of getting connected include direct computer connection; partnering with local colleges or universities; joining a regional network such as CICNet, which serves seven Midwest states; and commercial vendors. Names and phone numbers of five vendors are given. Equipment needs and user costs are discussed, as well as resources for learning more about the Internet. Contains 16 references. (TD)

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The Internet and World-Wide-Web: Potential Benefits to Rural Schools

Paper presented at the 87th Annual Conference of the National Rural Education Association

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by

Bruce O. Barker
Professor and Chairperson
Department of Media and Educational Technology
College of Education and Human Services
Western Illinois University
Macomb, Illinois 61455
e-mail: bo-barker@bgu.edu

The Internet and the National Information Infrastructure

Promotion of the National Information Infrastructure (NII) by the federal government, commonly referred to as the "Information Superhighway," has placed increased emphasis on educators to better understand and learn how to access the vast amounts of information available on computer networks (U.S. Department of Commerce, 1994). It is the **Internet** and its maze of computer networks that is increasingly being recognized as the Information Superhighway. Numerous commercial networks such as *America Online*, *Compuserve*, *Delphi*, *Genie*, and *Prodigy* have been in operation for several years -- serving as means of accessing remote databases, bulletin boards, electronic magazines/newsletters, etc. Now, however, these commercial networks are increasingly being seen as gateways into the Internet's immense data resources which are growing at an exponential rate.

The Internet is literally a labyrinth of computer networks which make available to users a mind-boggling array of information, services, and resources. No one knows how big the Internet is. Current estimates range between 15 million to 20 million users in as few as 60 to more than 200 countries (Estrada, 1993; Pawloski, 1994; The Internet Society, 1994).

The Internet Society estimates that this "mother of all computer networks" links more than 30,000 computer networks into one global network, and that it is experiencing a 15 percent growth rate in number of users each month (Jain, 1994). Composition of the Internet is estimated at 55% commercial networks, 35% educational networks, and 10% government networks (The Internet Society, 1994).

No one individual or group manages or controls the Internet. It is a decentralized collection of computer networks managed by separate groups who

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have agreed to a common set of technical standards or protocols which connect and interconnect their individual networks to one another for information sharing. The Internet uses a variety of operating systems which make it compatible to different types of computers for information access and data exchange.

The Internet as a Resource for K-12 Schools

The Internet has tremendous potential as an educational resource in K-12 settings, chiefly because proper use of the Internet demands that educators incorporate new strategies for teaching students. The Internet provides students and teachers with access to the following (Jones, Valdez, Rasmussen, 1994):

1. Networking and collaboration on the part of both students and teachers through worldwide electronic mail, distribution lists, and group mail.

2. Information through numerous kinds of databases and electronic bulletin boards, through which users can exchange ideas as well as huge amounts of information in the form of text, audio, and graphic formats, which can be located using a variety of search tools.

3. Collaborative investigation that allows teachers and students to investigate problems and issues and shared products across geographic and political boundaries.

4. Resources ranging from curricula to exemplary classroom activities that students and teachers can use at times most convenient for them.

Most of the information on the Internet is text-based. The release of Internet "browsers" such as the National Center for Supercomputing Applications' (NCSA) Mosaic™ in early 1994 and Netscape™ in late 1994, however, have made available thousands of materials on the Internet which combine text, audio, and graphics. Some documents even include short video clips -- all which can be downloaded and viewed on one's personal computer.

The Internet's resources can be grouped into three major categories: (1) messaging, (2) remote login, and (3) file exchange (Ayre, 1994; Dyrli, 1993). Messaging applications include electronic mail, discussion groups, and newsgroups. Remote login permits a user to "connect" to a computer system in a distant location thereby accessing information on the system through his or her own machine. File exchange is possible once a user has logged in to a distant computer or computer system. Through file transfer protocols, the user can copy the files from one computer and transfer them back to his/her own machine. Files might include text documents, computer programs, application programs, sound clips, images, photographs, or movie clips.

E-mail: Sending and receiving electronic mail (e-mail) is the most widely used application on the Internet. In addition to personal messages, e-mail also

includes files, reports, articles, journals, books, and even sound and graphics files. E-mail has allowed students and teachers to correspond on projects across the country and around the world. For example, when the Gulf War and the break-up of the Soviet Union occurred, classes connected to the Internet were able to communicate directly with people in the countries involved, confirming that the Internet knows no political or geographical boundaries (Dyrli, 1993).

Discussion groups: Internet users who share common interests can easily subscribe to discussion groups, or listservs, by adding their e-mail address to the appropriate interest group. There are literally thousands of discussion groups addressing virtually every topic of human interest. Most of these are free to join. Once a user has joined a listserv, e-mail from other users will automatically be sent to the user's e-mail address. The user can in turn respond to these messages which are sent out, over the Internet, to all other members of the same listserv.

Newsgroups: Unlike discussion groups or listservs, one does not subscribe to a newsgroup. Hence, e-mail messages are not automatically sent to individual users. Newsgroups can best be described as electronic bulletin boards which users access in order to find out the latest information on topics of interest. There are well over 1000 newsgroups on the Internet, and these numbers are increasing. Much like discussion groups/listservs, newsgroups cover a broad range of topics.

Benefit of the Internet for Rural and Small Schools

The Internet has the potential to radically change information access and learning resources in American schools. By making all kinds of information available to anyone with an Internet account, differences between big and small schools have begun to blur.

The dual stigma of remoteness and geographical isolation, so commonly associated with rural schools, begins to fade as more and more schools connect to the Internet. The vast domain of information contained within the Internet's archives can provide unlimited educational opportunities for today's students. For the first time in history, every school can -- without regard to size, location, or socioeconomic condition -- provide students the opportunity to access the same highway of information heretofore available only to students in the nation's most affluent schools.

Cautions for Schools in Using the Internet

The bulk of attention given to the phenomenal growth of the Internet by educators and writers is extremely positive. Yet it is notable that this network of networks, as one writer stated, is still in the Jurassic stage of development (Masters, 1994). It is also important that we not get swept away by the hype of it all (Billings, 1994). The Internet is a continually evolving information resource which is still in its very early stages of development. Access, depending on the number of users connected at any one time, can sometimes be slow and frustrating -- especially when any of the following messages appear

on one's computer screen: "unable to connect to remote host," or "connection to remote host refused," or "maximum users exceeded, try later."

In spite of all the accolades given to the Internet, there is a "down side" that educators might consider. The Internet can be highly addictive. It is not unusual for users to spend hours at a time communicating via computer with others on the Internet or simply browsing the unnumbered data resources.

Inasmuch as the Internet is a decentralized conglomeration of networks with no central administrative headquarters or governing body, much information on the Internet is controversial. The Internet, by design, is uncensored. No one fully monitors or censors information entered to Internet's archives. As a result, not only can students access unlimited information on almost every wholesome topic known to man, they can also access information on almost every deviant and perverse topic in our society. And, there is currently no easy way to totally restrict or limit student access through hardware or software devices.

Some K-12 school administrators have adopted an "Appropriate Use Policy for Internet Users" which stipulates that students shall not intentionally access or download any text file or picture, or engage in any conference that includes pornography, violence, racism, anarchy, treason, or discrimination. Access to such information is permitted only when (1) permission has been granted from the building principal, identifying the specific purpose and educational value of such access, and (2) the teacher has requested and received permission from the parent/guardian of each student involved (Wood, Hacket, Owens, Harrison, 1994).

Getting Connected to the Internet?

There are a number of ways that users can log on to the Internet. One is by means of a computer which is directly connected to the Internet (Hahn and Stout, 1994). Most Internet users at universities, government agencies, and large corporations have their own Internet accounts which are paid for by their institutions. As a result, many users think the Internet is free. The Information Superhighway, however, is not a freeway; it is a toll-way.

Some K-12 schools have partnered with local colleges or universities to receive Internet accounts. In many cases these have been provided at no cost or at nominal cost to the school. The host institution, however, does pay a recurring telephone or line access charge to connect to the Internet. Understandably, most rural schools are not near universities so do not have this option open to them.

An alternative for connecting new users is to gain entrance through a commercial vender. The user pays a monthly bill to receive an Internet account and typically also pays a "use fee" based on number of hours use online each month. Logging on through a commercial vender usually permits access to messaging services such as e-mail, discussion groups, and newsgroups, but may not provide users with a "full connect" to databases offering images, sound, and video clips. Among some of the commercial vendors serving as

entrance points or "gateways" to the Internet are **America Online**, **Compuserve**, **Delphi**, **Genie**, and **Prodigy** (Cahape, 1994). Toll free telephone numbers to contact these vendors for current information on costs and services are: American Online, 800/827-6364; Compuserve, 800/848-8199; Delphi, 800/544-4005; Genie, 800/638-9636; and Prodigy, 800/776-3449.

Another means of connecting to the Internet is through a statewide or regional network. One example is **CICNet** (Committee of Institutional Cooperation network) which is a regionally based not-for-profit network that provides full Internet access for individuals as well as multiple users through toll free telephone dial access from anywhere in the United States. CICNet fosters network connectivity in the Midwest specifically serving the states of Minnesota, Iowa, Wisconsin, Illinois, Indiana, Michigan, and Ohio. Many of the linkages for statewide and area networks in these states onto the Internet have been made through CICNet (Petrowski, 1994). Educators in the Midwest interested in learning more about the CICNet, services provided, and current connection/use cost for educators can call 313/998-6103 or reach CICNet by facsimile machine at 313/998-6105.

Equipment Needs and Costs to Use the Internet

In order for a school to connect **one** work station to the Internet the following minimum equipment/telecommunications items are needed: direct telephone line (56 kilobits per second), modem connection (14,400 baud), telecommunications software, and either an MS-DOS computer 386 machine or greater operating on DOS 3.1 or higher with at least 640K internal memory and a hard drive with at least 3.5 megabyte of disk space available) or any Macintosh computer which runs System 7.0 or greater with at least 2 megabyte of internal memory and a hard drive with at least 2 megabyte of disk space free. To connect a second or multiple work stations at a school site, additional computers and peripherals would be needed as well as another direct phone line connection if the link is via dial-up access. If the plan is to connect a multiple number of machines, it would be best to use a T1 telephone connection or multiple 56 kilobits per second phone lines and access through a direct connection rather than individual modems.

For those few schools which are able to connect to the Internet through a university or corporate sponsor, the cost for connect fees will likely be minimal or non-existent. Commercial vendors typically assess a monthly charge as well as a use fee based on the number of hours per month each machine is online or the number of times specific services have been used. Fees and methods of charging vary. An example of charges might be 6 cents per minute while on line; 25 cents for each time specific services (e.g. listservs, e-mail, etc.) are accessed; or a set charge for the first 10 hours of online time each month, followed by 3-4 cents per minute for online time thereafter. Inasmuch as fees are constantly subject to change, interested readers should contact potential providers for current and detailed pricing options. It is not unusual for users who get "hooked" on the Internet to spend three hours or more a day online. The online connect charges do add up, particularly if multiple machines are on-site and user demand is high.

Learning More About the Internet

The explosive growth of the Internet has resulted in an increasing number of articles and books on the subject. Due to the ever evolving and changing nature of the Internet, any book on the subject is dated shortly after publication. Recent titles which have received positive reviews include (Tanaka and Rogers, 1995): *Everybody's Guide to the Internet*, by Adam Gaffin, MIT Press; *The Whole Internet*, by Ed Krol, O'Reilly and Associates; *Internet Starter Kit*, by Adam Engst, Hayden Books; *The Internet Roadmap*, by Bennet Falk, Sybex; and *The Internet Unleashed*, authored by over two dozen people, published by Sam's Publishing.

Perhaps one of the best resources is to get on the Internet itself and begin "net-surfing." The Frequently Asked Questions (FAQ) data file on the Internet will help orient newcomers. Also, the Internet is a "hot" topic at many professional workshops and seminars statewide and nationally. Attendance at such sessions will likely be useful in acquiring a basic awareness of Internet protocols for navigating through and searching for information.

Understanding and connecting to the Internet can be complicated. And, it will be some time before all schools in Illinois are connected. In rural areas particularly, state-of-the-art telephone services needed to transport high band widths of data are not as readily available as in more populated areas. Current wisdom suggests that it may be the year 2000 before high band telecommunications networks are fully operational in all sectors of our country (Graumann, 1994).

To find out more about what school leaders need to do to get connected to the Internet and the status of phone line services in their local area, school administrators might contact their local telephone carrier to inquire about telephone connections to their school that will link them to the Internet. Contacting some of the Internet gateway providers listed in this report will result in an increased understanding of equipment needs, line costs, and current services which are available.

If the technology of the printing press and books revolutionized learning in the 15th century, it will be the technology of the computer and the Internet which revolutionize learning in the 21st century. Once the Internet evolves to its full potential, and students and teachers get skilled in navigating through its databases and services, the information of the world will truly be at their fingertips and before their very eyes.

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